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APPLICATION AND EVALUATION OF SATELLITE REMOTE SENSING DATA AND AUTOMATIC PROCESSING TECHNIQUES FOR STATE-WIDE LAND USE AND OTHER RESOURCE MANAGEMENT

LANDSAT FOLLOW-ON INVESTIGATION #20820

(CONTRACT NO. NAS5-20918)

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PROGRESS REPORT FOR QUARTER ENDING OCTOBER 21, 1975

Prepared for

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GREENBELT, MARYLAND 20771

20820

INTRODUCTION

This report summarizes activities under the State of Mississippi's LANDSAT Follow-on Investigation, for the period ending October 21, 1975. This effort involves joint activities with the NASA/JSC Earth Resources Laboratory at Bay St. Louis, Mississippi, and with a number of key state agencies. The Office of Science and Technology (Office of the Governor) provides overall project management, and coordinates the multi-agency participation.

This reporting period constitutes the second quarter of operations under the contract. During this period, significant progress has been made in the conversion of NASA-developed pattern-recognition software for use on state-owned computers. There has also been continued progress in the joint activities with the field personnel and resource management discipline specialists of the participating state agencies. In summary, efforts are well under way toward achieving the major objectives of the investigation - the software conversion and subsequent production of specific resource inventories.

The contents of this report are organized consistent with the first quarter report, and will serve as an update, with minimum repetition of previously reported information.

A. PROBLEMS.

As noted in the first quarter report, problems had been encountered with regard to the spacecraft data accounts and Standing Request/Order specifications at the U. S. Geological Survey's EROS Data Center in Sioux Falls, South Dakota. These problems were eliminated during August, 1975, with the assistance of Mr. Edmund F. Szajna of NASA/ Goddard Space Flight Center, Technical Monitor. Effective August 18. the allocation of funds between LANDSAT imagery and CCT's was changed as follows: Imagery (Account #G20820) - $1,600; CCT's (Account #GB 0820) - $5,800. This allocation is consistent with the emphasis of our investigation on the use of digital data for surface classification, with imagery being used primarily for screening and gross-level analysis. The original specifications for our Standing Request/Order also were changed so as to make the system useful in screening LANDSAT coverage for subsequent orders of CCT's and imagery. Effective August 27, the necessary revisions to the specifications were: (1) Change date limitation so as to require continuous search of LANDSAT II coverage during the course of the investigation; (2) reduce automatic order to a single 7.3" black and white paper print of MSS band-7 only. By incorporating these revisions, the progress of the investigation has not been impeded.

B. ACCOMPLISHMENTS.

Building on activities begun during the first quarter of operations, continuing progress has been made in major task areas of the investigation, as follows:

1. State-wide Ground Truthing Effort. The second state-wide ground truthing effort, which was initiated July 1, 1975, is approximately 80% complete as of this report. This effort includes the participation of approximately 150 individuals located in all areas of the State. Ground truth information - data on selected sites representing the surface features of interest (crops, forest cover, wetlands, urban, etc.) - is a prerequisite for making a supervised classification from LANDSAT digital data. This information is collected by County Agents, County Foresters, Game Biologists, and other state agency personnel, usually in the course of their normal duties. Utilizing aerial photos and/or existing land use maps to locate the sample areas, the field personnel visit the sites and record pertinent observations on Ground Truth Data Forms, which are then submitted for joint use by the Office of Science and Technology and NASA/ERL. Subsequently, these sites are located in the LANDSAT digital data and serve as training samples to develop the corresponding spectral signatures for use with the Pattern Recognition software. This enables the production of computer-assisted surface classifications, from which specific resource inventories are derived.

For the purposes of this investigation, approximately 700 ground truth sites were identified, distributed throughout all 82 counties of Mississippi. To date, the cooperation of field personnel has been excellent. As the subsequent resource inventories are produced, the results will be made available to these same field personnel for use in their respective disciplines, such as agriculture, forestry, wildlife management, and coastal zone management.

2. Meetings with State Agency Participants. During this quarter, representatives of the Office of Science and Technology and NASA/Earth Resources Laboratory have continued to meet with state agency representatives for the purpose of establishing working relationships for the production, evaluation, and application of the specific resource inventories. Meetings have been held during this period with representatives of the Board of Water Commissioners, Central Mississippi Planning and Development District, Mississippi Marine Resources Council, Mississippi Research and Development Center, and State Geological Survey.

3. Software Conversion Effort. Significant progress was made during the past three months in the conversion of NASA-developed pattern recognition software for use on the State Computer Center's IBM 370/155 system. Problems arising from incompatibilities in input/output functions and bit manipulation routines had been identified during the first quarter. These problems were resolved by systems analysts and programmers of the Office of Science and Technology (OST) and the State Computer Center, with assistance from technical specialists at NASA/ERL. This effort was aided by the acquisition of the FTIO software package from NASA/GSFC, through NASA/ERL.

With these problems overcome, the reprogramming effort proceeded, and conversion of the first two modules of the software system was completed in mid-October. These two modules, entitled ERTREF and DAPIDS, enable a LANDSAT CCT to be reformatted and the data then displayed on an image display system for the purpose of isolating training samples, or for other purposes. A gray-scale plot or film strip recording of the raw

data may also be output at this point. The conversion of ERTREF and DAPIDS is highly significant, since the computer-assisted classification of LANDSAT digital data relies on the display tape produced at this point, and the remaining four software modules interface with this data format. After conversion of the two programs, a LANDSAT CCT was processed at the State Computer Center, and the resultant display tape was then brought up on a display system at NASA/ERL. The results were considered excellent, both by OST and NASA/ERL personnel. A gray-scale plot was also obtained.

This accomplishment is considered to be a major milestone in the software conversion effort. Optimistically, it may be possible to complete the conversion of the remaining four software modules by the end of the next quarter.

4. Acquisition of Aircraft Data. During this reporting period, aircraft data for Subsite 3, Mississippi Delta, and Subsite 4, Northeast Mississippi, were acquired. The digital data were received and data processing was initiated. The corresponding color infrared imagery was also ordered, received, and indexed. Aircraft data over Subsite 2, Gulf Coast and Coastal Counties, were acquired on October 20, and have not yet been received.

5. Acquisition of Spacecraft Data. As a result of our Standing Request with Sioux Falls, we are automatically receiving Band 7 black and white prints of all LANDSAT-2 scenes over Mississippi which contain 50% or less cloud cover. To date, we have received imagery on 50 frames.

These are presently being evaluated for the purpose of ordering CCT's for those frames which will best meet the requirements of this investigation. An order of CCT's is anticipated during the coming quarter.

C. SIGNIFICANT RESULTS.

None to report as yet.

D. PUBLICATIONS.

None to report as yet.

E. RECOMMENDATIONS.

None to report as yet.

F. FUNDS EXPENDED.

Total vouchered cost for the first six months of operation under the contract is $25,058 out of the $125,000 funded by NASA/GSFC to the State of Mississippi. The value of the State's contribution to date, which includes the cost of the completed first statewide ground truthing effort and associated training, is placed at $43,103.

G. DATA USE.

For the total effort, through October 28, 1975, the tabluation is as follows:

	Value of Data Allowed	Value of Data Ordered	Value of Data Received
Aircraft	$11,376	$5,214	$5,214
Spacecraft	7,700	459	423

H. AIRCRAFT DATA.

Under this investigation, high resolution products from aircraft data are to be utilized in three ways: (1) To evaluate the accuracy of the products produced from LANDSAT data; (2) for evaluation from a standpoint of using satellite data from various spectral bands; and (3) providing high resolution data of critical areas for applications evaluations. To date, the investigation has not progressed far enough in the processing of either aircraft or spacecraft data to make an assessment of the usefulness of the aircraft data for the purposes described above. However, during this quarter, the color infrared photography of Subsite 1, Hinds and Rankin Counties, was utilized by three different state agencies for their own purposes: (1) An enlargement of a portion of one frame was obtained by the State Tax Commission, for their evaluation with regard to future mapping requirements; (2) the Mississippi Research and Development Center made a black and white duplicate of the entire coverage for various uses, including analysis of tax mapping requirements; and (3) the State Highway Department made a black and white duplicate of the Rankin County coverage, to use in updating their highway map of that county.